LAKE SEMINOLE HYDRILLA ACTION PLAN: DEVELOPMENT AND IMPLEMENTATION

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Abstract. This paper describes an effort by the U.S. Army Corps of Engineers (Corps) to manage the invasive aquatic plant *Hydrilla verticillata* (hydrilla). This plant causes serious water resource problems such as adverse impacts to small boat navigation, water quality, fish and wildlife habitat, water-borne recreation, and hydropower production. An integrated management plan, including several traditional chemical, biological, and mechanical methods, was developed to address reducing the coverage of hydrilla on the lake and to enhance restoration of mixed native aquatic plant communities. Two of the hydrilla management tools that are in the process of implementation on Lake Seminole, grass carp confined behind electric fish barriers and low dose herbicide application system, are innovative technologies, particularly for the scale being applied on the lake. Both techniques are showing excellent potential to provide significant hydrilla control on Lake Seminole, as well as other areas, at considerable cost savings compared with traditional herbicide applications or mechanical harvesting.

INTRODUCTION

Since impoundment of Lake Seminole, Florida (Gadsden and Jackson Counties), Georgia (Decatur and Seminole Counties), and Alabama (Houston County), in 1957, this U.S. Army Corps of Engineers lake, has had several aquatic plant species grow to problem levels, particularly hydrilla. These plants have caused serious water resource problems such as small boat navigation interference, water quality degradation, fish and wildlife habitat degradation, recreation area use interference (e.g., obstruction of swimming beaches and boat ramps), increased shoreline extension into the lake by trapping sediments, increased mosquito production, hydropower intake structure blockage, and a decrease in adjacent property values. Hydrilla, the current major problem plant, was discovered on the lake in 1967. Based on a 1997 survey, this non-native plant dominates the submersed plant community, which covers approximately 13,400 acres (40% lakewide), of the lake. Total aquatic plant coverage on the lake was approximately 55% (with significant arms of the lake under almost 90% coverage). A number of aquatic plant management techniques have been utilized since project construction in 1957, including chemical (herbicides), biological, and mechanical. These costly management options have failed to adequately control the growth of hydrilla.

HYDRILLA ACTION PLAN DEVELOPMENT

A management plan was developed through an interagency effort from 1994 to 1998 (Corps 1998). The Hydrilla Action Plan identified three hydrilla management objectives: a) control of hydrilla at the priority hydrilla management areas; b) reduce hydrilla-dominated aquatic vegetation to less than 40% surface coverage for four management compartments on the lake; and, c) significantly enhance restoration of mixed native aquatic plant communities on the lake. An integrated hydrilla management approach was the strategy recommended for the final Hydrilla Action Plan. The plan includes three confined grass carp sites (using electric fish barriers); use of a low dose herbicide application system on Spring Creek; use of mechanical harvesting for selected small boat channels; continued testing/monitoring of hydrilla flies; and maintenance control of hydrilla at the other priority hydrilla management sites within the lake with a reduced traditional fluridone and endothall herbicide program. The plan provides control of hydrilla at the priority hydrilla management areas; reduces hydrilla to less than 40% within the four management

compartments (controls hydrilla on 7,433 acres in the lake, a 140% increase compared with the traditional historic herbicide program); and significantly increases the mixed native plant communities within the lake. The use of sterile grass carp behind electric fish barriers and use of the low dose fluridone treatment has shown significant results on Lake Seminole and these two innovative methods are discussed in more detail.

GRASS CARP WITH ELECTRIC BARRIERS

The use of triploid (sterile) grass carp to control hydrilla is a method that has been successfully applied to small ponds and lakes for many years; however, use on large reservoirs has met with mixed results and public controversy. In a large open system, such as Lake Seminole, some type of grass carp confinement system is required to reduce escape of the vegetation eating fish and destruction of valuable aquatic grass beds in the downstream Apalachicola River and Bay area. Two types of physical barrier were tested on Fish Pond Drain (900 acres) (Figure 1) and Cypress Pond (580 acres) areas of Lake Seminole beginning in 1995 (Corps 1995). Unacceptable escape rates were documented from both areas (initial stocking rate of 12 fish per water surface acre), although no fish feeding damage was observed downstream. The Corps and Smith-Root, Incorporated, with cooperative funding from the Florida Department of Environmental Protection, installed a low voltage electric fish barrier on Fish Pond Drain in September 1997 (Figure 2). The second (supplemental) stocking of grass carp at the Fish Pond Drain site took place in February 1999 (9 fish per water surface acre). The electric fish barrier has worked well, containing all 84 radio-tagged fish (Maceina and Slipke 1999). Although grass carp feeding has created limited open areas (estimated less than 5%) in the Fish Pond Drain area, the stocking rate is not adequate for hydrilla control.

The confined grass carp technique is recommended for management of hydrilla at three sites, totaling 1,983 acres (Fish Pond Drain, Cypress Pond and upper Saunders Slough). The Corps plans to stock additional grass carp into the Fish Pond Drain area (5 fish per surface acre) in early 2001 and to expand the use of the electric fish barriers for the Cypress Pond and upper Saunders Slough areas as funds become available.

LOW DOSE FLURIDONE TREATMENT

The control of hydrilla in slowly moving waters has been successfully performed based on regular

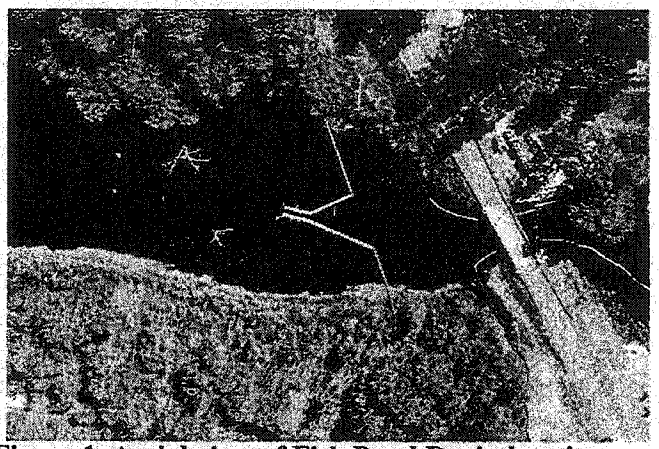


Figure 1 Aerial view of Fish Pond Drain barrier

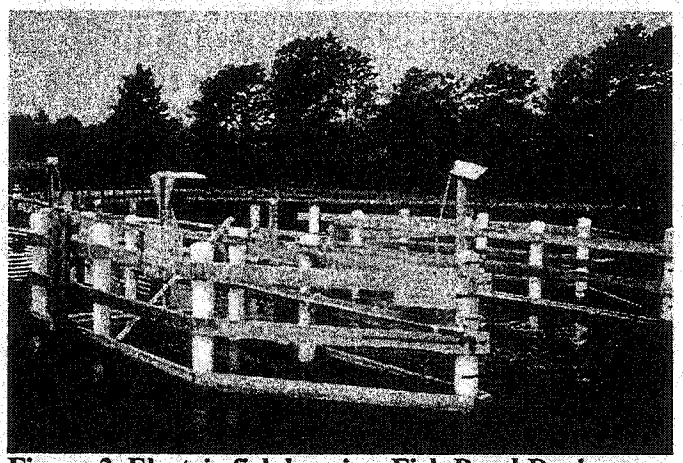


Figure 2 Electric fish barrier, Fish Pond Drain

applications of extremely low doses of fluridone (10-15 ppb) over a period of several weeks. This application technique has been accomplished on the upper St. Johns River (Haller, Fox, and Shilling 1990) and the Withlacoochee River (Fox, Haller, and Shilling 1994) in Florida. The herbicide fluridone (tradename Sonar AS®) was applied to the Spring Creek embayment of the lake through an application system installed near the Georgia Highway 253 bridge. The target application rate was 15 ppb of fluridone in the water column, based on technical guidance from the Corps' Waterways Experiment Station and the University of Florida's Center for Aquatic Plants (Haller, Getsinger, and Fox 1995). This target was generally maintained. The bottleneck in the creek created by the bridge makes this an ideal spot for the application site. The low dose treatment was initiated on May 22, 2000 and ran continually for 60 days, and was stopped on July 21st. Observations during the ensuing two-week period revealed that the hydrilla started widespread regrowth throughout the upper Spring Creek treatment area, with the plants regenerating some lateral buds after the fluridone levels had dropped to undetectable. As a

result of this rapid regrowth the Corps decided on August 4th to turn the system back on. The system was operated for 28 more consecutive days, with the phase two application stopping on September 1st. Regrowth of hydrilla during the fall of 2000 and continuing low flow conditions prompted the initiation of a third phase of treatment, commencing on November 9th and ending on January 9, 2001 (60 days). The low dose system was operated for a total of 148 days and hydrilla was actively growing throughout these treatment periods. The metering device consisted of a Liquid Metronics, Incorporated® 12-volt DC pump, one 10-gallon tank, and four marine-grade deep cycle 12-volt batteries. The equipment was protected in a small metal shed. The application site was visited and monitored on a daily basis. Information from a U.S. Geological Survey streamflow gaging site located 6 miles upstream was downloaded daily from their internet website. From the daily flow rates, the appropriate amount of herbicide was determined. The application pump was then calibrated to inject this amount of herbicide over the next 24-hour period. To confirm the rate of application, fluridone residues were monitored at 26 locations downstream. The chemical analysis used to determine the fluridone level was the FasTEST® immunoassay method patented by the SePRO® Corporation. Residues in the treatment "plume" typically ranged from 5 to 20 ppb. The photographs (Figures 3 and 4) below show an area on Spring Creek before and after the year 2000 low dose application.

The low dose application results can be broken into five zones of effectiveness based on visual observations in the fall of 2000. Application from the low dose application system effected in some way approximately 3,400 acres of the Spring Creek area (see Figure 5). Excellent control was observed on about 1,670 acres, from the application point downstream to about 0.5 mile below the Fireman's Cut small boat channel; moderate control on the adjacent approximate 700 acre area downstream to just south of Grassy Flats; poor control on the approximate 700 acre area downstream to just downstream from Sealy Point; and minimal control/minor herbicide damage on the approximate 325 acre area downstream to the junction of Spring Creek and Fish Pond Drain (Wind Mill Cut Lower Section). In general, from the field observations, the hydrilla surface mats "dropped out" from the application site at Highway 253 down to Fireman's Cut (linear distance of approximately 5.5 miles). From Fireman's Cut south to Rattlesnake Point (linear distance of approximately 1.3 miles), the hydrilla was severely damaged and growth was retarded or stopped. This area remained opened to outboard boats throughout the remainder of the growing season. Downstream of this area, in front of Sealy Point (linear distance of approximately 2.3 miles), the hydrilla was injured but not enough to cause any major "fall out" of the dense hydrilla mats. Hydrilla growth within this area was stunted and most of the area was useable with an outboard boat. Based on the initial year efforts, total aquatic plant surface coverage for the Spring Creek compartment has been reduced from 89% (1997 survey) to 47% (based on visual damage estimates in the fall of 2000). More detailed and quantitative monitoring of vegetation, fisheries, and waterfowl effects are continuing by the Corps, Georgia Department of Natural Resources, and Auburn.

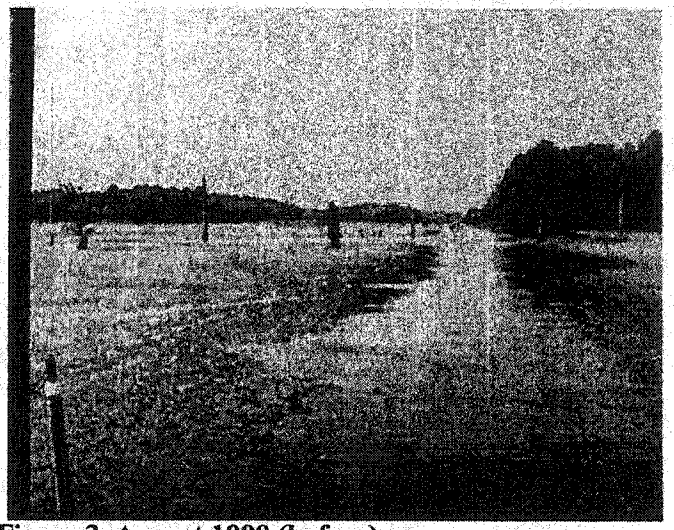


Figure 3 August 1999 (before)

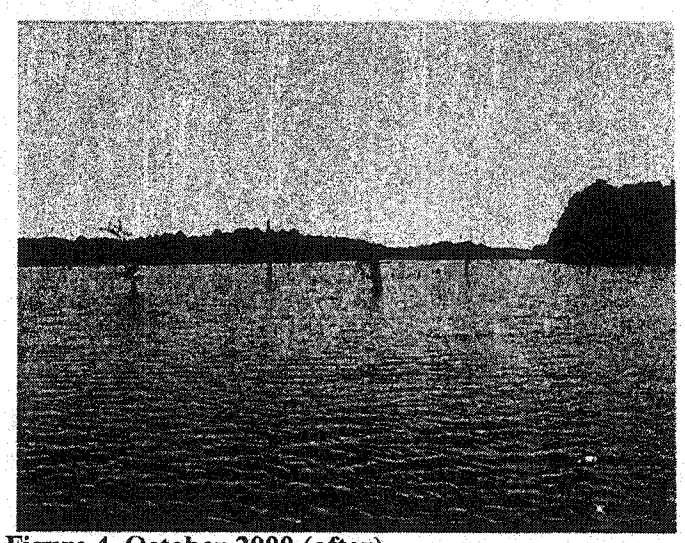
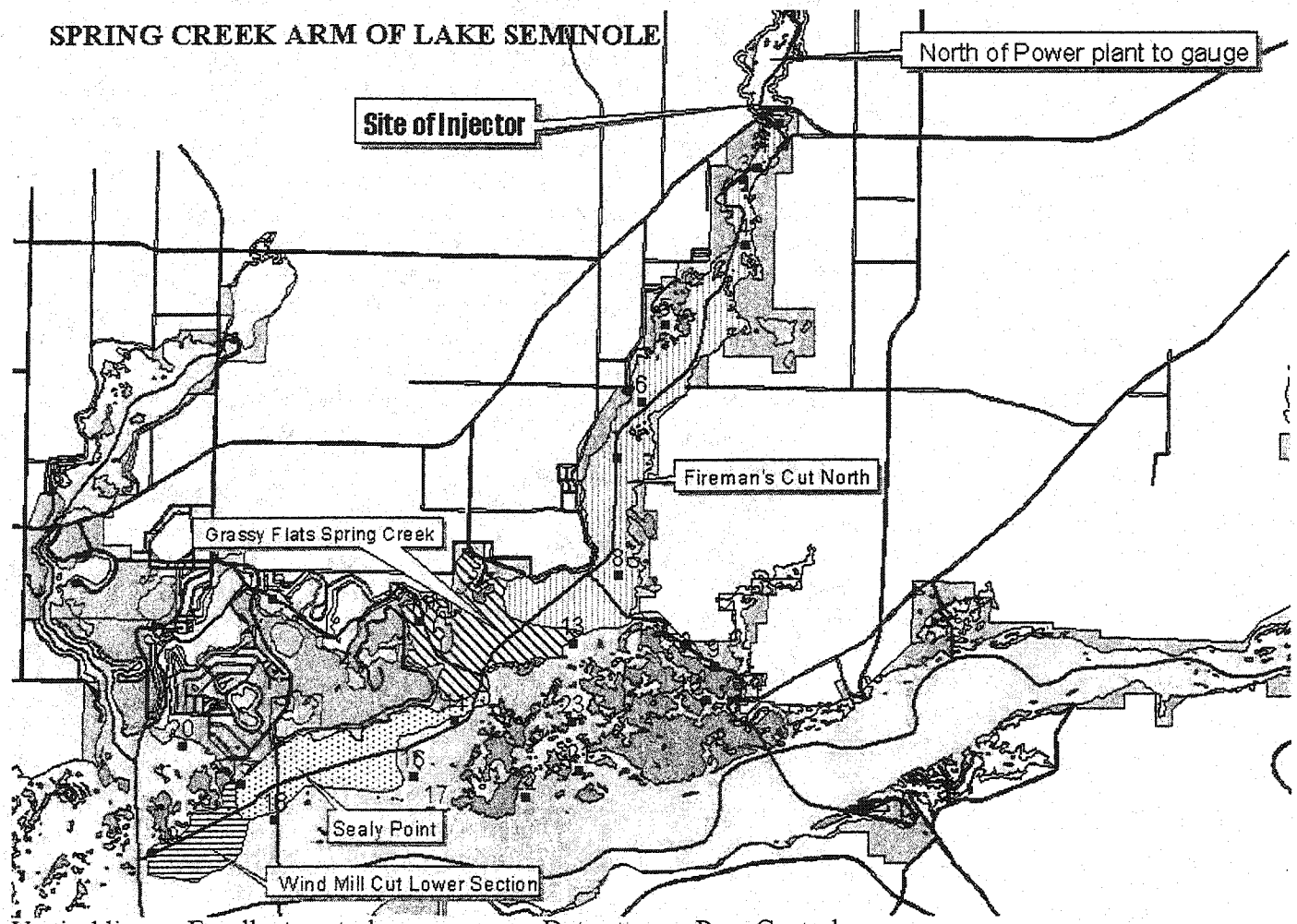


Figure 4 October 2000 (after)

The Corps plans to implement the second year of the low dose fluridone application during the summer of 2001 (contingent upon availability of funds and suitably low flows in Spring Creek).



Vertical lines = Excellent control
Diagonal lines = Moderate control
Dot pattern = Poor Control
Horizontal lines = No control/minimal fluridone exposure

Figure 5 Low dose treatment on Spring Creek area of Lake Seminole.

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